No. XX.

Philadelphia, Auguſt 4th, 1800.

DEAR SIR,

Read Aug. 15, 1800. WITH this you will receive my aſtronomical, and thermometrical obſervations, made at the confluence of the Miſſiſſippi, and Ohio rivers, in Dec. 1796, and Jan. 1797, at Natchez in the years 1797 and 1798—likewiſe at the city of New Orleans, in Jan. and Feb. 1799, to which are added the obſervations on the tranſit of ☿ made at Miller's plantation on the Coenecuch, commonly, (though erroneouſly), called the Eſcambia.—The aſtronomical obſervations made at the confluence of the Miſſiſſippi, and Ohio rivers, the equal altitudes of the ſun at Natchez, with the obſervations made at New Orleans, are entered according to the civil account, for the purpoſe of bringing the thermometrical obſervations into the journal, in the manner they are generally regiſtered.

The obſervations made on the boundary between the United States, and his Catholic Majeſty, will conſtitute a ſeparate paper, and of very conſiderable length, in which the longitudes, of a number of points in the line are determined, both by lunar obſervations, and the eclipſes of ♃'s ſatellites. This work, will probably be ready for the ſociety ſome time the enſuing winter.

Aſtronomical,

Aſtronomical, and Thermometrical Obſervations, made at the Confluence of the Miſſiſſippi, and Ohio Rivers.

1796.

Dec. 18th. Arrived at the confluence of the Miſſiſſippi, and Ohio rivers about 2 o'clock in the afternoon.—Cloudy all day.—Thermometer 24° in the air at ſun ſet, and 34° in the water.

19th. Pitched a tent, and ſet the clock up in it.—Cloudy all day, except a ſhort time about noon.—Thermometer by Fahrenheit's ſcale 9° at ſun riſe, roſe to 19°; fell to 12° at ſun ſet, and to 11° at 9^h P. M.

20th. *Equal altitudes of the Sun.*
A. M. 10^h 23′ 54″. P. M. 1^h 37′ 37″.

Cloudy, except about 1½ hours before and after noon, which accounts for the equal altitudes not being taken farther from the meridian.—Cleared off in the evening.—Thermometer 11° at ſun riſe, roſe in the afternoon to 22°, fell to 11° at 9^h P. M.

Immerſion of the 3d ſatellite of ♃ obſerved at 9^h 8′ 47″ P. M. Magnifying power of the teleſcope 120—♃ being very low, and attended with an uncommon tremour, which rendered the obſervation ſomewhat doubtful.

21ſt. Flying clouds all day, but diſappeared in the evening.—Thermometer 11° at ſun riſe, fell to 8° at 10^h A. M. roſe to 9° at noon, fell to 3° at 7^h P. M.

Emerſion of the 1ſt ſatellite of ♃ obſerved at 6^h 56′ 0″ P. M. Atmoſphere a little hazy.—Magnifying power of the teleſcope 120.

The

1796. The weather was ſo intenſely cold, that although a pot of live coals was kept in the tent near the clock, the thermometer which was fixed to the caſe, fell to 4°, and the clock ſtopped at 5^h the next morning.

22d. Keen north wind; with ſqualls of light ſnow. —Clear in the evening.—Thermometer 5° below o at 8 o'clock A. M.—roſe to 1° above o at 2^h P. M.—fell 5° below o at 9^h P. M. —Both rivers on account of the vaſt bodies of ice, thrown up in a variety of poſitions, make a romantic, and to us (on account of our boats) an alarming appearance.

23d. Clear day. Wind from the N. W. Thermometer $7\frac{1}{2}$° below o at 8^h A. M. 6° below o at 10^h A. M. 1° above o at noon, 8° at 2^h P. M. and at 8^h P. M. 7°.

24th. Clear day. Thermometer 7° at 9^h A. M. —17° at 1^h P. M.—and 7° at 8^h P. M.

Traced a meridian by the circum-polar ſtars.

25th. Clear day. Thermometer 7° at ſun riſe, roſe in the afternoon to 17°. Applied the magnetic needle to the meridian, and found the variation to be 7° 15′ eaſt.

Set up a ſmall zenith ſector of about 19 inches radius. Face to the caſt.

26th. Cloudy in the afternoon. Thermometer 10° in the morning, roſe to 17°.

⊙'s preceding limb on the meridian at .	11^h	59′	45″
Subſequent do. at	12	2	9
Centre at	12	0	57

27th.

Dec. 27th. Clear day. Thermometer 3° at ſun riſe, roſe to 33° in the afternoon.

⊙'s preceding limb on the meridian at	12h	0′	33″
Subſequent do. at	12	2	57
Centre at	12	1	45

28th. Clear day. Thermometer 8° at ſun riſe, roſe in the afternoon to 33°.

Equal altitudes of the Sun.
A. M. 9h 40′ 2″. P. M. 2h 24′ 56″.

Emerſion of the 1ſt ſatellite of 4 obſerved at 8h 48′ 38″ P. M. 4 very low, the atmoſphere hazy, and the belts ſcarcely diſcernible. Magnifying power of the teleſcope 120.

29th. Clear a ſhort time about noon. Thermometer 17° at ſun riſe, roſe in the afternoon to 45°.

30th. Cloudy with light ſnow during the day.—Clear in the evening. Thermometer 32° in the morning, roſe to 35° in the afternoon.

31ſt. Cloudy in the evening and night. Thermometer 21° at ſun riſe, roſe in the afternoon to 45°.

Equal altitudes of the Sun.
A. M. 9h 53′ 7″. P. M. 2h 16′ 25″.

Obſerved zenith diſtance of α Lyræ . 1° 37′ 23″ N.

1797. Clear and calm in the morning, flying
Jan. 1ſt. clouds in the afternoon.—From 10h A. M. till noon, three fine luminous circles appeared in the atmoſphere, ſimilar to thoſe deſcribed

by Dr. Smith in his opticks*. Thermometer 21° at ſun riſe, roſe in the afternoon to 40°.

2d. Cloudy with ſnow the whole day.—Thermometer 16° at ſun riſe, roſe in the afternoon to 28°, and fell to 19° at ſun ſet.

3d. Cloudy till noon, clear in the afternoon and evening. Thermometer 6° at ſun riſe, roſe in the afternoon to 18°, fell to 10° at 8^h P. M.

Obſerved zenith diſtance of α Cygni . 7° 35′ 32″ N.
do. . . β Andromedæ 2 25 38 S.
do. . . . β Meduſæ . 3 11 46 N.

4th. Cloudy in the morning, the remainder of the day clear. Thermometer 12° at ſun riſe, roſe in the afternoon to 37°, fell to 16° at ſun ſet.

Equal altitudes of the Sun.
A. M. 9^h 26′ 36″. P. M. 2^h 47′ 6.5″.

Obſerved zenith diſtance of α Cygni . 7° 35′ 29″ N.

Turned the face of the Sector to the weſt.

Obſerved zenith diſtance of β Andromedæ 2° 30′ 24″ S.
do. . . β Meduſæ . 3 7 5 N.

5th. Clear all day. Thermometer 23° at ſun riſe, roſe in the afternoon to 42°, fell to 30° at ſun ſet.

Equal altitudes of the Sun.
A. M. 9^h 42′ 21″. P. M. 2^h 32′ 31″.

Obſerved

* Book Second, Chap. 11th.

Obſerved the times, and diſtances of the ☽'s nearſt limb from that of the ☉ as follows:

	Times. h ′ ″	Diſtances. ° ′ ″	
P. M.	2 50 53	84 15 20	
	2 52 56	84 16 0	Error of Sextant + 7″.
	2 54 40	84 16 30	
	2 58 43	84 18 20	
Means	2 54 18	84 16 32	

Obſerved zenith diſtance of α Lyræ . 1° 33′ 28″ N.
do. . . . α Cygni . 7 31 19 N.
do. . . β Meduſæ 3 7 5 N.

6th. Cloudy in the morning, clear in the afternoon.—Thermometer 24° at ſun riſe, roſe in the afternoon to 34°, fell to 12° at ſun ſet.

Obſerved zenith diſtance of β Meduſæ . 3° 7′ 17″ N.

7th. Clear day, wind N. W.—Thermometer 7° below 0 at ſun riſe, 5° below 0, at 9ʰ A. M. roſe to 19° in the afternoon, fell to 0 at ſun ſet.

Obſerved zenith diſtance of α Lyræ . 1° 33′ 37″ N.
do. . . α Cygni . 7 31 27 N.
do. . . . β Andromedæ 2 30 6 S.
do. . . β Meduſæ . 3 7 17 N.

Turned the face of the Sector eaſt.

8th. Clear day. Thermometer 7° below 0 at ſun riſe, roſe in the afternoon to 29° above 0, fell to 10° at 7ʰ P. M.

Obſerved zenith diſtance of α Lyræ . 1° 37′ 40″ N.
do. . . β Andromedæ 2 25 47 S.
do. . . . β Meduſæ . 3 11 49 N.

9th. Clear day. Thermometer 3° below 0 at ſun riſe, roſe in the afternoon to 42°, fell to 32° at ſun down.

Obſerved zenith diſtance of α Lyræ .	1°	37′	40″	N.
do. . . β Andromedæ	2	25	56	S.
do. . . . β Meduſæ .	3	11	27	N.

Latitude

Latitude deduced from the Zenith Distances.

Face of the Sector East. Observed Zenith Distances.

1796.		β Andromedæ.	β Medusæ.	α Lyræ.	α Cygni.
		° ′ ″	° ′ ″	° ′ ″	° ′ ″
Dec. 31st.	.....	.....	.....	1 37 23 N.	.....
1797. Jan. 3d.	.....	2 25 38 S.	3 11 46 N.	.....	7 35 32 N.
4th.	.....	.....	.....	.....	7 35 29 N.
8th.	.....	2 25 47 S.	3 11 49 N.	1 37 40 N.	.....
9th.	.....	2 25 56 S.	3 11 27 N.	1 37 40 N.	.....
	Means	2 25 47 S.	3 11 41 N.	1 37 34 N.	7 35 30.5 N
4th.	..... Face of the Sector West.				
4th.	.....	2 30 24 S.	3 7 5 N.	.....	.....
5th.	.....	.....	3 7 5 N.	1 33 28 N.	7 31 19 N.
6th.	.....	.....	3 7 17 N.	.....	.....
7th.	.....	2 30 6 S.	3 7 19 N.	1 33 37 N.	7 31 27 N.
	Means	2 30 15 S.	3 7 11 N.	1 33 32.5 N.	7 31 23 N.
Mean.	Face of the sector east ..	2 25 47 S.	3 11 41 N.	1 37 34 N.	7 35 30.5 N.
	Correct observed zenith distances .	2 28 1 S.	3 9 26 N.	1 35 33.2 N.	7 33 26.7 N.
	Refractions	+ 2.5	+ 3	+ 1.5	+ 7.5
	Correct zenith distances	2 28 3.5 S.	3 9 29 N.	1 35 34.7 N.	7 33 34.2 N.
Mean declinations Jan. 4th 1797.		34 32 26.7 N.	40 09 55.9 N.	38 36 1.2 N.	44 33 41.5 N.
	Aberration	+ 7.2	+ 9.7	—3.1	+ 4.3
	Nutation	— 7.1	—5.2	—0.9	—4.1
	Correct declinations	34 32 26.8 S.	40 10 0.4 N.	38 35 57.2 N	44 33 41.7 N.
	Correct zenith distances applied ..	+2 28 3.5 S.	−3 9 29 N.	−1 35 34.7 N.	−7 33 34.2 N
	Latitudes	37 0 30.3 N.	37 0 31.4 N.	37 0 22.5 N.	37 0 7.5 N.

		°	′	″	
Latitude by	β Andromedæ .	37	0	30.3	
do. .	β Meduſæ . .	37	0	31.4	
do. .	α Lyræ . .	37	0	22.5	
do. .	α Cygni . .	37	0	7.5	
Mean Latitude . . .		37	0	22.9	North.

Longitude deduced from the eclipſes of ♃'s ſatellites and one lunar obſervation.

			′	″	Daily gain. ′	″
1796. Dec. 20th.	Clock too faſt mean time .	2	10			
	Stopped on the 23d by the extreme cold.					
26th.	Clock too ſlow mean time .	0	38			
27th.	do.	0	19.5	. .	0	18.5
28th.	do.	0	7.5	. .	0	12
31ſt.	Clock too faſt mean time .	0	38 5	. .	0	15.3
1797. Jan. 4th.	do.	0	54.5	. .	0	4
5th.	do.	1	2.0	. .	0	7.5

The immerſion of the 3d ſatellite of ♃ was obſerved on the 20th of December at 9^h 8′ 47″ P. M. as before noted: The clock by equal altitudes of the ſun taken on that day appeared to be too faſt 2′ 10″ mean time, and gained by ſubſequent obſervations at a mean rate about 10″ per diem. The clock was therefore too faſt at the time of the obſervation 2′ 14″, the obſervation was of courſe made at 9^h 6′ 37″ P. M. mean time, to which add 1′ 13″ the equation of time, the ſum 9^h 7′ 50″ will be the apparent time of the immerſion, which taken from 15^h 2′ 34″ the apparent time at Greenwich by the theory, will leave 5^h 54′ 44″ for the difference of meridians.

An emerſion of the firſt ſatellite of ♃ was obſerved on the 21ſt of December at 6^h 56′ 00″ P. M. The clock at that time by admitting the mean daily gain to be 10″ was too faſt 2′ 25″ mean time, the obſervation was therefore made at 6^h 53′ 35″ mean time, to which add 0′ 46″ the equation of time, and the ſum 6^h 54′ 21″ will be the apparent time of the obſervation, which deducted from 12^h 49′ 29″ the apparent time at Greenwich by the theory, will give 5^h 55′ 8″ for the difference of meridians.

Another emerſion of the 1ſt ſatellite of ♃ was obſerved on the 28th of December at 8^h 48′ 38″ P. M. The clock at that time was about 1″ too ſlow mean time. The obſervation was therefore made at 8^h 48′ 39″ mean time, from which deduct 2′ 44″ the equation of time, and the remainder 8^h 45′ 55″ will be the apparent time of the obſervation, which deducted from 14^h 41′ 53″ the apparent time at Greenwich by the theory, will give 5^h 55′ 58″ for the difference of meridians.

On the 5th of January 1797, at 2^h 54′ 18″ P. M. by the clock, the diſtance between the neareſt limbs of the ☉ and ☽ was obſerved to be 84° 16′ 39″ the clock at the time of obſervation was 1′ 2″ too faſt mean time, the obſervation was therefore made at 2^h 53′ 16″ mean time, from which deduct

deduct 6′ 15″ the equation of time, and the remainder 2^h 47′ 1″ will be the apparent time of the obſervation. The obſerved diſtance corrected for parallax refraction, &c. will anſwer to about 8^h 42′ 22″ at Greenwich, by which the difference of meridians appears to be about 5^h 55′ 21″.

By ſuppoſing the obſervation on the 3d ſatellite of ♃, with the lunar obſervation to be equivalent to either of thoſe on the 1ſt ſatellite, the mean longitude will be had as below.

	h	′	″
Longitude by the 3d ſatellite .	5	54	44
do. by the lunar obſervation	5	55	21
Mean . . .	5	55	2.5
do. by the 1ſt ſatellite on the 21ſt of December	5	55	8
do. by do. on the 28th of December	5	55	58
Mean . . .	5	55	22.8 = 88° 50′

42″ weſt from Greenwich, or 0^h 54′ 47″.8 = 13° 41′ 57″ weſt from the city of Philadelphia.

The foregoing obſervations were made under very unfavourable circumſtances, the weather intenſely cold, and not a ſufficient number of tents to ſecure our inſtruments, and cover our men: our ſtore-boat having been left behind, and was frozen up near the mouth of the Wabaſh river till about the 20th of January. The ſpirits in the veſſel in which the plummet of the ſector was ſuſpended were frequently congealed, and what appeared ſomewhat ſingular, was that the ſpirits began to freeze on the outſide of the veſſel very near to the upper edge, from which it extended in prongs, like bucks-horns, and did not congeal within till the ſpirits fell about $\frac{4}{10}$ of an inch below the upper edge.—The veſſel was $1\frac{1}{2}$ inches in diameter.—The ice on the outſide did not appear to contain a full proportion of ſpirit. Although the obſervations were made under unfavourable circumſtances, I have no reaſon to ſuppoſe them liable to any material objection, and therefore preſume that the determinations of the latitude, and longitude, of the confluence of the two rivers are ſufficiently correct for geographical purpoſes, notwithſtanding

ſtanding a difference of about 2 degrees in longitude, and 14 minutes in latitude, from Mr. Hutchins's map.

1797.

Feb. 24th. Arrived at Natchez.

27th. Encamped at the north end of the village.

28th. Set up the clock.

March 1ſt. Set up the large zenith ſector, with the face to the eaſt.

3d. *Equal altitudes of the Sun.*
A. M. 9^h 50′ 11″. P. M. 2^h 9′ 11″.

The obſerved times, and diſtances of the ⊙'s and ☽'s neareſt limbs

	Times. h	′	″	Diſtances. °	′	″	
	2	54	35*	59	46	0	
	2	56	18	59	46	40	
	2	59	20	59	47	0	Error of the Sextant 0″.
	3	0	38	59	47	20	
	3	3	53	59	47	50	
Means .	2	58	58	59	46	58	

Repeated.

	h	′	″	°	′	″	
	3	45	6	60	2	10	
	3	48	18	60	2	30	
	3	51	22	60	2	40	
	3	52	45	60	3	0	Error of the Sextant 0″.
	3	54	37	60	4	40	
	3	56	39	60	4	50	
	3	58	47	60	5	20	
	4	0	34	60	5	40	
Means .	3	54	16	60	3	51	

Repeated.

* All the obſervations connected *with*, or dependent upon *time*, are entered as obſerved by the clock, and will therefore require a correction to reduce them to mean ſolar time, which may readily be done from the *ſtatement* of the errors of the clock, with its rate of going, to be found at the end of each courſe of obſervations.

Repeated.

	h	′	″		o	′	″	
	4	24	18		60	11	55	
	4	26	15		60	12	30	
	4	28	14		60	13	20	Error of the Sextant o″.
	4	29	50		60	13	35	
	4	32	5		60	14	20	
Means .	4	28	10		60	13	8	

4th. The obſerved times, and diſtances of the ☉'s and ☽'s neareſt limbs.

	Times.			Diſtances.			
	h	′	″	o	′	″	
	2	6	22	72	5	30	
	2	7	34	72	5	50	
	2	8	29	72	6	30	Error of the Sextant o″.
	2	9	29	72	6	40	
	2	10	23	72	7	0	
	2	11	44	72	7	30	
Means .	2	9	0	72	6	29	

Repeated.

	h	′	″	o	′	″	
	4	47	45	72	57	0	
	4	49	26	72	57	30	
	4	51	10	72	57	40	
	4	52	16	72	58	20	Error of the Sextant o″.
	4	53	31	72	58	20	
	4	54	30	72	58	40	
	4	55	19	72	58	40	
	4	56	21	72	59	0	
Means .	4	52	17	72	58	9	

5th.

		o	′	″	
Obſerved zenith diſtance of	Pollux .	3	2	58	S.
do. . .	Caſtor .	0	45	56	N.
do. . . .	Pollux .	3	03	1	S.
do. . .	β Tauri .	3	7	59	S.

6th. *Equal altitudes of the Sun.*
A. M. 9^h 37′ 57″. P. M. 2^h 18′ 54″.

The obſerved times, and diſtances of the ☉'s and ☽'s neareſt limbs.

	Times. h	′	″	Diſtances. °	′	″	
	2	32	57	98	11	20	
	2	34	2	98	11	40	
	2	35	10	98	12	0	
	2	36	4	98	12	0	Error of the Sextant 0″.
	2	36	49	98	12	30	
	2	37	38	98	12	50	
	2	38	33	98	13	20	
Means	2	35	53	98	12	14	

7th. Obſerved zenith diſtance of β Tauri . 3 7 57 S.
do. . . . Caſtor . 0 45 55 N.
do. . . . Pollux . 3 2 58 S.

8th. *Equal altitudes of the Sun.*
A. M. 9^h 23′ 42″. P. M. 2^h 31′ 26″.

Obſerved zenith diſtance of β Tauri . 3 8 0 S.
do. . . . Caſtor . 0 45 56 N.
do. . . . Pollux . 3 2 56

9th. Turned the face of the ſector weſt.

Obſerved zenith diſtance of Pollux . 3 4 0 S.
10th. do. . . Caſtor . 0 44 55 N.
do. . . . Pollux . 3 3 59 S.

11th, 12th, and 13th. Cloudy with conſtant, but not heavy thunder.

14th. Cleared off very early in the morning with a violent gale of wind which blew down a number of the tents, and puſhed in the ſide of the one we uſed for the obſervatory againſt the clock, where it reſted till the gale was over, which did not exceed 15 minutes.

Equal

Equal altitudes of the Sun.
A. M. 9^h 41′ 58″. P. M. 2^h 7′ 36″.

		°	′	″	
	Obſerved zenith diſtance of β Tauri .	3	8	58	S.

15th, and 16th. Cloudy with ſome thunder and a little rain.

			°	′	″	
17th.	Obſerved zenith diſtance of	β Tauri .	3	8	58	S.
	do.	Caſtor .	0	44	57	N.
	do.	Pollux .	3	3	56	

The obſerved times, and diſtances of the ☉'s and ☽'s neareſt limbs.

	Times.			Diſtances.			
	h	′	″	°	′	″	
	20	57	41	109	43	40	
	20	59	55	109	42	30	
	21	1	44	109	41	20	Error of the Sextant 0″.
	21	2	51	109	40	30	
	21	4	35	109	39	30	
	21	5	49	109	39	00	
Means .	9	1	49	109	41	5	

18th. *Equal altitudes of the Sun.*
A. M. 9^h 13′ 10″. P. M. 2^h 31′ 38″.

			°	′	″	
	Obſerved zenith diſtance of	β Tauri .	3	8	54	S.
19th.	do. . .	Caſtor .	0	44	50	N.
20th.	do. . . .	β Tauri .	3	8	55	S.

21ſt. Stopped the clock and ſet it forward about 9 minutes.—Screwed up the pendulum bob.

Equal altitudes of the Sun.
A. M. 9^h 53′ 24″. P. M. 2^h 3′ 43″.

The obſerved times, and diſtances of the ☉'s and ☽'s neareſt limbs.

	Times. h	′	″	Diſtances. °	′	″	
	21	18	5	65	50	30	
	21	21	28	65	50	0	
	21	23	29	65	50	0	
	21	24	12	65	49	20	Error of the Sextant 0″.
	21	25	7	65	48	40	
	21	26	17	65	48	0	
	21	29	17	65	47	30	
Means .	9	23	55	65	49	9	

Repeated.

	h	′	″	°	′	″	
	21	30	35	65	46	40	
	21	31	40	65	46	30	
	21	33	19	65	46	30	
	21	34	41	65	46	0	Error of the Sextant 0′.
	21	36	10	65	45	30	
	21	37	43	65	45	20	
	21	39	14	65	45	0	
Means .	21	34	46	65	45	56	

22d. Obſerved zenith diſtance of β Tauri . 3° 8′ 57″ s.

The obſerved times, and diſtances of the ☉'s and ☽'s neareſt limbs.

	Times. h	′	″	Diſtances. °	′	″	
	21	42	32	54	49	20	
	21	43	35	54	48	50	
	21	44	28	54	48	20	Error of the Sextant 0″.
	21	45	40	54	48	10	
	21	46	32	54	48	00	
Means .	21	44	33	54	48	32	

23d. Obſerved zenith diſtance of β Tauri . 3° 8′ 56″ s.

The

The obſerved times, and diſtances of the ☉'s and ☽'s neareſt limbs.

	Times. h	'	"	Diſtances. °	'	"	
	21	21	16	43	53	10	
	21	23	7	43	52	40	
	21	24	13	43	52	20	Error of the Sextant 0″.
	21	25	15	43	52	10	
	21	26	52	43	52	00	
Means .	21	24	9	43	52	28	

From this time I was too much occupied in other concerns, occaſioned by the different commotions in the country, to attend to a regular ſeries of obſervations till October; there are therefore but few entered till that time.

28th. *Equal altitudes of the Sun.*
A. M. 9^h 28′ 32″. P. M. 2^h 26′ 43″.

April 7th. Obſerved zenith diſtance of Caſtor . 0° 44′ 56″ N.

From this time, till the 4th of June no attention was paid to the clock, it ran down ſeveral times.

June 12th. *Equal altitudes of the Sun.*
A. M. 8^h 58′ 4″. P. M. 3^h 8′ 50″.

Immerſion of the 1ſt ſatellite of ♃ obſerved at 15^h 28′ 25″.—Belts tolerably diſtinct, magniſying power of the teleſcope 120.

17th. *Equal altitudes of the Sun.*
A. M. 8^h 54′ 41″. P. M. 3^h 13′ 49″.

26th. Clock removed from the tent, into a houſe where I went to reſide myſelf, but on account of the ſickneſs which prevailed on the river, I removed in July with my people about ſeven miles into the country and encamped, where

where I remained till the 27th of September, and then returned to the village of Natchez.

28th. Cleaned the clock and ſet it a-going.

Immerſion of the 1ſt ſatellite of ♃ obſerved at $14^h\ 30'\ 10''$.—Belts diſtinct, magnifying power 120.

29th. *Equal altitudes of the Sun.*

	h ′ ″		h ′ ″
A. M.	8 53 21.5.	P. M.	3 5 17.5.

Doubtful 2 or 3 ſeconds.

30th. *Equal altitudes of the Sun.*

A. M. $8^h\ 59'\ 44''$. P. M. $2^h\ 58'\ 35''$.

Immerſion of the 1ſt ſatellite of ♃ obſerved at $8^h\ 59'\ 19''$. Belts diſtinct, magnifying power 120.

Oct. 2d. Prepared to obſerve an eclipſe of the 4th ſatellite of ♃. The ſatellite was not eclipſed, neither am I convinced that it touched the ſhadow of ♃, it was very diſtinct, and appeared when neareſt, to be its full diameter from the body of the planet.

7th. *Equal altitudes of the Sun.*

A. M. $9^h\ 2'\ 10''$. P. M. $2^h\ 54'\ 14''$.

From this time, till the beginning of January following, it was with difficulty I could ſit up long enough to make an obſervation, owing to a ſevere fever.

18th. *Equal altitudes of the Sun.*

A. M. $8^h\ 58'\ 41''$. P. M. $2^h\ 56'\ 52''$.

25th. *Emerſion* of the 1ſt ſatellite of ♃ obſerved at $5^h\ 55'\ 12''$.—Belts diſtinct, magnifying power 120.

26th. *Equal altitudes of the Sun.*

A. M. $9^h\ 9'\ 25''$. P. M. $2^h\ 47'\ 5''$.

Nov. 22d. Clock ran down, wound it up, ſet it a-going, and lowered the pendulum bob.

24th.

24th. *Equal altitudes of the Sun.*
A. M. 9^h 28′ 26″. P. M. 2^h 38′ 35″.

Emerſion of the 1ſt ſatellite of ♃ obſerved at 8^h 7′ 33″. —Belts diſtinct, magnifying power 120.

26th. *Equal altitudes of the Sun.*
A. M. 9^h 30′ 44″. P. M. 2^h 37′ 48″.

Dec. 1ſt. Thermometer roſe to 78°.—Muſquitoes very troubleſome at night.

2d. Thermometer 50° at ſun riſe, fell to 47°.—Cloudy.

3d. Thermometer 22° at ſun riſe, roſe to 35°. —Snow and hail without intermiſſion till 6^h P. M. when it cleared away with a ſtrong N. W. wind.

Obſervations on a lunar eclipſe.

	h	′	″
Beginning	8	38	34
Beginning of total darkneſs	9	37	35
End of total darkneſs	11	18	59
End of the eclipſe	12	18	12

During the above obſervation the thermometer was at 20°.

4th. Thermometer 18° at ſun riſe, roſe to 33°. —Mr. Dunbar's thermometer was at 17° in the morning.

Equal altitudes of the Sun.
A. M. 9^h 17′ 7″. P. M. 2^h 57′ 35″.

5th. Thermometer 20° at ſun riſe, roſe to 37°.

6th. Thermometer 18° at ſun riſe, roſe to 39°.

Equal altitudes of the Sun.
A. M. 9^h 25′ 15.5″. P. M. 2^h 51′ 24.5″.

7th. Thermometer 30° at ſun riſe, roſe to 49°.

Emerſion

Emerſion of the 2d ſatellite of ♃ obſerved at 7^h 56′ 31″.—Belts diſtinct, magnifying power 120.

8th. Thermometer 33° at ſun riſe, roſe to 51°.

Equal altitudes of the Sun.
A. M. 9^h 56′ 15″. P. M. 2^h 22′ 19^s.

9th. Thermometer 30° at ſun riſe, roſe to 47°. —Cloudy.

10th. Thermometer 28° at ſun riſe, roſe to 56°.

11th. Thermometer 40° at ſun riſe, roſe to 60°.

12th. Thermometer 52° at ſun riſe, roſe to 75°. —Cloudy part of the day.

13th. Thermometer 60° at ſun riſe, roſe to 75°. —Flying clouds.

14th. Thermometer 63° at ſun riſe, roſe to 75°. —It was 74° at 9^h in the evening, a thunder guſt at midnight.

15th. Thermometer 46° at ſun riſe, roſe to 50°. —Flying clouds.

16th. Thermometer 30° at ſun riſe, roſe to 51°.

Equal altitudes of the Sun.
A. M. 9^h 28′ 0″. P. M. 2^h 58′ 15″.

17th. Thermometer 50° at ſun riſe, roſe to 55°.

Emerſion of the 1ſt ſatellite of ♃ obſerved at 8^h 24′ 30″. —A little hazy, but the belts were middling diſtinct, magnifying power 120.

18th. Thermometer 43° at ſun riſe, roſe to 54°.

Equal altitudes of the Sun.
A. M. 9^h 50′ 14″. P. M. 2^h 38′ 8″.

19th. Thermometer 30° at ſun riſe, roſe to 53°. —Cloudy with ſome cold rain.

20th.

20th. Thermometer 34° at ſun riſe, roſe to 51°. —Cloudy with cold rain.—Cleared off at night with a N. W. wind.

21ſt. Thermometer 17½° at ſun riſe, roſe to 37°.

Equal altitudes of the Sun.

	h	′	″		h	′	″
A. M.	9	46	43.5.	P. M.	2	44	58.5.

22d. Thermometer 23° at ſun riſe, roſe to 41°. —Cloudy.

23d. Thermometer 28° at ſun riſe, roſe to 37°. —Flying clouds.

24th. Thermometer 41° at ſun riſe, roſe to 50°.

Emerſion of the 1ſt ſatellite of 4 obſerved at 10h 21′ 1″. —A little hazy, belts middling diſtinct, magnifying power 120.

25th. Thermometer 55° at ſun riſe, roſe to 60°. —Cloudy with a little rain.

26th. Thermometer 64° at ſun riſe, fell to 40°. —Cloudy with a N. E. wind.

27th. Thermometer 22° at ſun riſe, roſe to 39°. —Wind N. W.

28th. Thermometer 28° at ſun riſe, roſe to 54°.

29th. Thermometer 31° at ſun riſe, roſe to 52°.

30th. Thermometer 53° at ſun riſe, roſe to 65°. —Heavy rain.

31ſt. Thermometer 55° at ſun riſe, roſe to 57°. —Heavy rain.

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Jan. 1ſt. Thermometer 31° at ſun riſe, roſe to 67°.

Equal altitudes of the Sun.

A. M. 9h 50′ 10″. P. M. 2h 53′ 43″.

2d. Thermometer 48° at ſun riſe, roſe to 61°. —Cloudy.

At 15 minutes after 8 o'clock A. M. ſtopped the clock about 19 minutes by my watch, and lowered the pendulum bob a ſmall matter, but ſcarcely diſcernible with a magnifying glaſs.

3d. Thermometer 45° at ſun riſe, roſe to 52°.

4th. Thermometer 47° at ſun riſe, roſe to 63°. —Cloudy great part of the day.

Immerſion of the 3d ſatellite of 4 obſerved at . 6h 36′ 51″.
Emerſion do. at . 8 36 23.
} Belts diſtinct, magnifying power 120.

5th. Thermometer 27° at ſun riſe, roſe to 67°.

Equal altitudes of the Sun.
A. M. 9h 33′ 5″. P. M. 2h 36′ 44″.

6th. Thermometer 37° at ſun riſe, roſe to 61°. —Cloudy.

7th. Thermometer 55° at ſun riſe, roſe to 72°. —Rain.

8th. Thermometer 55° at ſun riſe, roſe to 73°.

Equal altitudes of the Sun.
A. M. 9h 41′ 30″. P. M. 2h 30′ 55″.

Emerſion of the 2d ſatellite of 4 obſerved at 7h 22′ 12″. —Belts diſtinct, magnifying power 120.

9th. Thermometer 35° at ſun riſe, roſe to 62°.

Equal altitudes of the Sun.
A. M. 9h 40′ 21″. P. M. 2h 32′ 52″.

Emerſion of the 1ſt ſatellite of 4 obſerved at 8h 23′ 10″. —Belts diſtinct, magnifying power 120.

10th. Thermometer 24° at ſun riſe, roſe to 66°. —Cloudy.

11th.

11th. Thermometer 23° at ſun riſe, roſe to 61°. —Cloudy with ſome rain.

12th. Thermometer 27° at ſun riſe, roſe to 57°. —Cloudy.

13th. Thermometer 50° at ſun riſe, roſe to 65°. —Cloudy part of the day with rain.

14th. Thermometer 62° at ſun riſe, fell to 55°.—Heavy rain.

15th. Thermometer 37° at ſun riſe, roſe to 60°.

Equal altitudes of the Sun.

h ′ ″ h ′ ″

A. M. 9 29 10.5. P. M. 2 48 20.

Doubtful 3 or 4 ſeconds.

Emerſion of the 2d ſatellite of ♃ obſerved at $9^h\ 58'\ 28''$. —Belts obſcure, the planet and ſatellites very tremulous.—Magnifying power 120.

16th. Thermometer 32° at ſun riſe, roſe to 69°.

Equal altitudes of the Sun.

A. M. $9^h\ 23'\ 55''$. P. M. $2^h\ 54'\ 20''$.

Emerſion of the 1ſt ſatellite of ♃ obſerved at $10^h\ 19'\ 19''$. —Belts tolerably diſtinct, magnifying power 120.

17th. Thermometer 33° at ſun riſe, roſe to 76°.

18th. Thermometer 34° at ſun riſe, roſe to 64°.

19th. Thermometer 40° at ſun riſe, roſe to 60°. —Cloudy with ſome rain.

20th. Thermometer 54° at ſun riſe, roſe to 71°. —Cloudy.

21ſt. Thermometer 53° at ſun riſe, roſe to 68°. —Cloudy with rain.

22d. Thermometer 67° at ſun riſe, roſe to 76°. —Cleared off with a N. W. wind.

23d. Thermometer 22° at ſun riſe, roſe to 46°.

Equal altitudes of the Sun.
A. M. 9^h 13′ 47″. P. M. 3^h 8′ 2″.

The obſerved times, and diſtances of the ☉'s and ☽'s neareſt limbs.

Times. h	′	″	Diſtances. o	′	″	
3	23	15	74	27	5	
3	24	36	74	27	15	
3	26	24	74	27	40	
3	27	25	74	28	0	
3	28	34	74	28	10	
3	29	34	74	28	30	Error of the Sextant 0″.
3	30	25	74	28	50	
3	31	16	74	28	55	
3	32	8	74	29	0	
3	33	4	74	29	30	
3	33	46	74	29	40	
3	34	28	74	30	00	
Means . 3	29	35	74	28	33	

The obſerved times, and diſtances of the ☽'s weſtern limb from Aldebaran.

Times. h	′	″	Diſtances. o	′	″	
9	54	11	45	34	0	
9	55	14	45	33	30	
9	58	59	45	31	20	
10	0	6	45	30	40	
10	1	3	45	30	40	Error of the Sextant 0″.
10	2	5	45	30	20	
10	3	10	45	29	10	
10	4	53	45	28	0	
10	6	6	45	27	20	
Means 10	0	39	45	30	33	

24th. Thermometer 18° at ſun riſe, roſe to 49°. —N. W. wind.

Equal altitudes of the Sun.
A. M. 9^h 22′ 58″. P. M. 2^h 59′ 21″.

25th. Thermometer 48° at ſun riſe, roſe to 60°.

26th,

26th. Thermometer 66° at ſun riſe, roſe to 76°.
—Cloudy.
27th. Thermometer 49° at ſun riſe, roſe to 61°.
28th. Thermometer 34° at ſun riſe, roſe to 63°.

Equal altitudes of the Sun.
A. M. 9^h 11′ 52″. P. M. 3^h 11′ 51″.

29th. Thermometer 55° at ſun riſe, roſe to 76°.
30th. Thermometer 66° at ſun riſe, roſe to 82°.
31ſt. Thermometer 67° at ſun riſe, roſe to 81°.
Feb. 1ſt. Thermometer 59° at ſun riſe, roſe to 81°.
—Cloudy with ſome rain.
2d. Thermometer 64° at ſun riſe, roſe to 76°.
3d. Thermometer 63° at ſun riſe, roſe to 80°.
—Cloudy.
4th. Thermometer 66° at ſun riſe, roſe to 78°.
—Flying clouds.
5th. Thermometer 55° at ſun riſe, roſe to 79°.
6th. Thermometer 61° at ſun riſe, roſe to 71°.
—Cloudy with a little rain.
7th. Thermometer 54° at ſun riſe, roſe to 80°.

Equal altitudes of the Sun.
A. M. 9^h 30′ 53″. P. M. 2^h 53′ 48″.

8th. Thermometer 51° at ſun riſe, roſe to 66°.
—Heavy rain laſt night and this day.
9th. Thermometer 33° at ſun riſe, roſe to 57°.
—Wind N. W.

Equal altitudes of the Sun.
A. M. 9^h 4′ 35″. P. M. 3^h 19′ 50″.

Emerſion of the 2d ſatellite of 24 obſerved at 7° 2′ 52″.
—Belts diſtinct, magnifying power 120.

10th. Thermometer 31° at ſun riſe, roſe to 50.
11th. Thermometer 55° at ſun riſe, roſe to 70°.

12th.

12th. Thermometer 61° at ſun riſe, roſe to 78°.

Equal altitudes of the Sun.
A. M. 9^h 1′ 43″. P. M. 3^h 22′ 28″.

13th. Thermometer 64° at ſun riſe, roſe to 80°.
—Cloudy with a little rain.
14th. Thermometer 61° at ſun riſe, roſe to 81°.
15th. Thermometer 55° at ſun riſe, fell to 50°.
—Some rain.
16th. Thermometer 40° at ſun riſe, roſe to 55°.
—Cloudy in the forenoon.

Immerſion of the 3d ſatellite of ♃ obſerved at 6^h 51′ 32″.
—Belts middling well defined, magnifying power 120.

17th. Thermometer 30° at ſun riſe, roſe to 49°.
—Cloudy with a heavy rain at night.
18th. Thermometer 50° at ſun riſe, roſe to 56°.
—Cloudy.
19th. Thermometer 42° at ſun riſe, roſe to 55°.
—Cloudy.
20th. Thermometer 40° at ſun riſe, roſe to 54°.
—Cloudy part of the day.
21ſt. Thermometer 41° at ſun riſe, roſe to 66°.

Equal altitudes of the Sun.
A. M. 9^h 39′ 19″. P. M. 2^h 43′ 4″.

End of the obſervations at the Town of Natchez.

1797. The rate of the clock's going, at the town or village of Natchez.

		′	″	Daily loſs.
Clock too ſlow mean time March 3d.		12	32.4	11.0
do.	6th.	13	5.5	10.5
do.	8th.	13	26.6	11.2
do.	14th.	14	33.6	17.9*
do.	18th.	15	45.3	16.3
do.	20th.	16	18.0	

* The alteration in the going of the clock after the 14th muſt have been occaſioned by the tent being blown againſt it, as mentioned on the 15th.

Stopped

Stopped the clock and raiſed the pendulum bob.

				Daily gain.
		′	″	″
do.	21ſt.	8	40 1	6.6
do.	28th.	7	26.2	

From this time till the 4th of June the clock was but little attended to, and ran down ſeveral times.

				Daily loſs.
		′	″	″
Clock too faſt mean time June	12th	3	55	
do.	17th	3	40.6	2.9

June 26th. The clock was taken down and removed into a houſe, where it was not attended to till September 28th.

				Daily gain.
		′	″	″
Clock too faſt mean time Sept.	29th.	9	30.4	9.1
do.	30th.	9	39.5	9.7
do. Oct.	7th.	10	47.4	11.4
do.	18th.	12	53.0	11.4
do.	26th.	14	24.3	

Nov. 22d. Clock ran down, wound it up, ſet it a-going and lowered the pendulum bob.

				Daily gain.
		′	″	″
Clock too faſt mean time Nov.	24th.	16	22	
do.	26th.	16	28	3
do. Dec.	4th.	16	30	0.2
do.	6th.	16	37	3.5
do.	8th.	16	38.5	0.7
do.	16th.	16	40.5	0.2
do.	18th.	16	44	1.7
do.	21ſt.	16	52	2.7
do. 1798. Jan.	1ſt.	17	31	3.5

1798.

Jan. 2d. Stopped the clock about 19 minutes and lowered the pendulum bob.

		′	″	″	
Clock too ſlow mean time Jan.	5th.	1	21	0.3	daily gain.
do.	8th.	1	20	2.0	daily loſs.
do.	9th.	1	22	1.0	do.

do.

			′	″		″	
do.		15th.	1	28.2		0.8	daily gain.
do.		16th.	1	28		2.3	daily loſs.
do.		23d.	1	44		1.0	daily gain.
do.		24th.	1	43		1.7	daily loſs.
do.		28th.	1	50		3.5	do.
do.	Feb.	7th.	2	24.6		5.5	do.
do.		9th.	2	35.6		2.0	do.
do.		12th.	2	41.6		1.3	do.
do.		21ſt.	2	53.5			

1797.

The reſults of the obſervations made at Natchez for the Longitude.

			h	′	″
March	3d.	Longitude weſt from Greenwich by a lunar obſervation the ☽ from the ☉	6	6	24
		do.	6	6	41
		do.	6	5	54
	4th.	do.	6	6	33
		do.	6	5	37
	6th.	do.	6	4	27
	17th.	do.	6	5	48
	21ſt.	do.	6	5	2
		do.	6	6	34
	22d.	do.	6	5	34
	23d.	do.	6	6	37
June	12th.	do. by an immerſion of the 1ſt ſatellite of 4	6	6	5
Sept.	28th.	do.	6	6	23
	30th.	do.	6	6	13
Oct.	25th.	do. by an emerſion of do.	6	6	15
Nov.	24th.	do.	6	5	58
Dec.	3d.	by the beginning of the lunar eclipſe	6	5	36
		do. beginning of total darkneſs	6	6	6
		do. end of total darkneſs	6	5	29
		do. end of the eclipſe	6	5	38
	7th.	By an emerſion of the 2d ſatellite of 4	6	6	5
	17th.	do. 1ſt ſatellite	6	5	58
	24th.	do. do.	6	6	12
1798. Jan.	4th.	By an immerſion of the 3d ſatellite	5	58	11
		do. emerſion do.	6	0	47
		The immerſion of the ſame ſatellite by de Lambre's Tables	6	2	58
		Emerſion of do. by de Lambre's Tables	6	4	57
	8th.	Emerſion of the 2d ſatellite	6	5	43
	9th.	do. 1ſt	6	5	57
	15th.	do. 2d	6	5	27
	16th.	do. 1ſt	6	5	45

23d.

			h	′	″
23d.	.	By a lunar obſervation, the ☽ from the ☉.	6	4	41
		do. the ☽ from Aldebaran.	6	5	6
Feb. 9th.	.	By an emerſion of the 2d ſatellite	6	5	2
16th.	.	By an immerſion of the 3d do.	5	59	25
		do. by de Lambre's Tables	6	3	26

The longitude of Natchez is ſtated in the 4th volume of the Tranſactions of the American Philoſophical Society, page 451, at 16° 15′ 46″ weſt from Philadelphia, or 91° 29′ 16″ which is equal to 6h 5′ 57″ weſt from Greenwich.—That determination includes all the foregoing obſervations previous to the 10th of January, except the immerſion, and emerſion of the 3d ſatellite* on the 4th of that month, which from the imperfection of the theory were omitted.

* I have lately been furniſhed by Joſe Joaquin de Ferrer, an ingenious Spaniſh gentleman, with a number of valuable aſtronomical obſervations, which he has made at different places on this continent: among them there are three on the eclipſes of Jupiter's ſatellites made at la Guaira, which correſpond with an equal number of mine made at Natchez.—They are the following:

		Apparent Time. h ′ ″	h ′ ″
1798. Jan. 4th.	*Emerſion* of the 3d ſatellite of ♃ obſerved by Mr. de Ferrer at la Guaira	10 9 51	
	Obſerved at Natchez . . .	8 31 51	
	Difference of meridians . . .		1 38 0
do. 8th.	*Emerſion* of the 2d ſatellite of ♃ obſerved by Mr. de Ferrer at la Guaira	8 54 11	
	Obſerved at Natchez . . .	7 15 58	
	Difference of meridians . . .		1 38 13
do. 9th.	*Emerſion* of the 1ſt ſatellite of ♃ obſerved by Mr. de Ferrer at la Guaira	9 54 40	
	Obſerved at Natchez . . .	8 16 31	
	Difference of meridians . . .		1 38 9
	Mean		1 38 7.3

The teleſcopes uſed by Mr. de Ferrer and myſelf were both acromatic, and nearly of the ſame magnifying power, (that is about 120), the difference of the meridians will therefore require no correction on account of the difference of the inſtruments, and may be ſafely taken as above ſtated: by which it appears that the town of Natchez, is 1h 38′ 7″.3 or 24° 31′ 49″ weſt of la Guaira.—The latitude of la Guaira as determined by Mr. de Ferrer is 10° 36′ 40″ N.

Result of the observations for the latitude of Natchez.

Observed Zenith Distances of the following Stars.

Face of the Sector East.

1797.	β Tauri.	Castor.	Pollux.
	° ′ ″	° ′ ″	° ′ ″
March 4th.	. . . . .	. . . . .	3 2 58 S.
5th.	3 7 59 S.	0 45 56 N.	3 3 1
7th.	3 7 57	0 45 55	3 2 58
8th.	3 8 0	0 45 56	3 2 56
Means	3 7 58.7	0 45 55.9	3 2 58.2

Face of the Sector West.

9th.	. . . . .	. . . . .	3 4 0
10th.	. . . . .	0 44 55	3 3 59
14th.	3 8 58	. . . . .	. . . . .
17th.	3 8 58	0 44 57	3 3 56
18th.	3 8 54	. . . . .	. . . . .
19th.	. . . . .	0 44 50	. . . . .
20th.	3 8 55	. . . . .	. . . . .
22d.	3 8 57	. . . . .	. . . . .
23d.	3 8 56	. . . . .	. . . . .
April 7th.	. . . . .	0 44 56	. . . . .
Means	3 8 56.3	0 44 54.5	3 3 58.3
Means face east	3 7 58.7	0 45 55.9	3 2 58.2
Means	3 8 27.5	0 45 25.2	3 3 28.2
Refractions	+3.1	+0.7	+3
True zenith distance	3 8 30.6	0 45 25.9	3 3 31.2
Mean declinations March 15th.	28 25 20.3 N.	32 19 1.9 N.	28 30 10.7 N.
Aberrations	+1.7	+2.1	+0.8
Nutations	—1.0	+6.9	+3.4
Semi. ann. equations	+0.5	+0.4	+0.3
True declinations	28 25 21.5	32 19 11.3	28 30 15.2
True zenith distances applied	+3 8 30.6	—0 45 25.9	+3 3 31.2
Latitudes N.	31 33 52.1	31 33 45.4	31 33 46.4

	° ′ ″
Lat. by β Tauri	31 33 52.1
do. Castor	31 33 45.4
do. Pollux	31 33 46.4
Mean lat. N.	31 33 48 nearly.

Astronomical

Aſtronomical, and Thermometrical Obſervations, made at the City of New-Orleans on the Miſſiſſippi.

1799.

Jan. 10th. Set up the clock, thermometer 70° in the afternoon.

11th. Cloudy all day, thermometer 73° in the afternoon.

12th. Cloudy with miſt, thermometer 72° in the morning, fell to 65° in the evening.

13th. Cloudy in the afternoon, thermometer 70° in the morning, fell to 64° in the evening.

14th. Clear, thermometer 62° in the morning, roſe to 63° in the afternoon.

Equal altitudes of the Sun.
A. M. 9^h 6′ 42″. P. M. 2^h 53′ 3″.

Emerſion of the 1ſt ſatellite of ♃ obſerved at 6^h 10′ 37″ P. M.—Night clear, belts diſtinct, magnifying power 120.

15th. Clear day, thermometer 61° at ſun riſe, roſe in the afternoon to 68°.

Equal altitudes of the Sun.
A. M. 8^h 52′ 25″. P. M. 3^h 6′ 48″.

Set up the Sector of ſix feet radius. Face to the eaſt.

Obſervations on the paſſage of the ☽ over ♃, and three of his ſatellites.

	h	′	″	
2d. Satellite immerſed at . .	5	35	26	
1ſt. do.	5	41	7	
♃ began to immerſe at . .	5	44	5	
♃ immerſed at . . .	5	46	22	
4th. Satellite immerſed at . .	5	53	47	P. M.
1ſt. do. emerged at . .	7	2	0	
♃ began to emerge at . .	7	4	42	
♃ emerged at . . .	7	6	50	
4th. Satellite do. at . . .	7	16	48	

The 3d ſatellite at the time of its immerſion was obſcured by a ſmall cloud, and as it emerged about the time that ♃ was $\frac{2}{3}$ emerged, it was not attended to ſo accurately, as to entitle it to a place among the obſervations.

16th. Cloudy with rain, thermometer 62° at ſun riſe, fell in the afternoon to 59°.

17th. Cloudy with rain, thermometer 58° at ſun riſe, roſe in the afternoon to 67°.

18th. Cloudy, thermometer 59° in the morning, roſe in the afternoon to 61°.

19th. Clear, thermometer 56° at ſun riſe, roſe in the afternpon to 66°.

Equal altitudes of the Sun.

A. M. 9^h 10′ 47″. P. M. 2^h 46′ 10″.

		°	′	″	
Obſerved zenith diſtance	β Andromedæ	4	36	28	N.
do. . .	β Tauri .	1	31	6	S.
do. . . .	Caſtor .	2	22	15	N.
do. . .	Pollux .	1	26	35·5	S.

20th. Clear in the morning, cloudy in the evening, thermometer 60° at ſun riſe, roſe in the afternoon to 69°.

Obſerved zenith diſtance α Coro. Borealis 2° 32′ 52″ S.

Equal altitudes of the Sun.

h	′	″		h	′	″
A. M. 9	40	27.	P. M. 2	15	49·5.	

21ſt. Cloudy all day, clear in the evening, thermometer 60° in the morning, roſe to 69° in the afternoon.

Emerſion of the 1ſt ſatellite of ♃ obſerved at 8^h 2′ 9″ P. M.—Belts diſtinct, magnifying power of the teleſcope 120.

		°	′	″	
Obſerved zenith diſtance	β Tauri .	1	31	10	S.
do. . .	Caſtor .	2	22	14	N.
do. . . .	Pollux .	1	26	31·5	S.

22d.

22d. Clear day, thermometer 61° at ſun riſe, roſe in the afternoon to 72°.

Equal altitudes of the Sun.
A. M. 9^h 36′ 39″. P. M. 2^h 18′ 18″.

			°	′	″	
Obſerved zenith diſtance	β Andromedæ		4	36	29	N.
do. . .	β Tauri	.	1	31	9	S.
do. . .	Caſtor	.	2	22	12.5	N.
do. . .	Pollux	.	1	26	35.5	S.

23d. Clear day, thermometer 66° at ſun riſe, roſe in the afternoon to 74°.

			°	′	″	
Obſerved zenith diſtance	α Coro. Borealis		2	32	51	S.
do. . .	β Andromedæ		4	36	30	N.

Turned the face of the Sector to the weſt.

Obſerved zenith diſtance of Pollux . 1° 28′ 16″ S.

24th. Clear day, thermometer 68° at ſun riſe, roſe in the afternoon to 77°.

Obſerved zenith diſtance of α Coro. Borealis 2° 34′ 34″ S.

Equal altitudes of the Sun.
A. M. 8^h 54′ 0″. P. M. 2^h 59′ 33″.

The equal altitudes of this day are doubtful 2 or 3 ſeconds, from the violence of the wind.

Obſerved zenith diſtance β Andromedæ 4° 34′ 49″ N.

The above zenith diſtance is doubtful, from the effect of the wind on the plumb-line.

			°	′	″	
Obſerved zenith diſtance	β Tauri	.	1	32	47	S.
do. . .	Caſtor	.	2	20	35	N.
do. . .	Pollux	.	1	28	17	S.

25th. Heavy fog in the morning, thermometer 70° at 6 o'clock A. M. and 79° in the afternoon.

Obſerved

		o	′	″	
	Obſerved zenith diſtance of β Andromedæ	4	34	46	N.
	do. . . β Tauri .	1	32	50	S.
26th.	do. . α Coro. Borealis	2	34	31.5	S.

Clear till 9 o'clock A. M. afterwards flying clouds, thermometer 75° all laſt night, roſe in the afternoon to 79°.

27th. Cloudy with fine rain—the thermometer continued at 77° all laſt night, fell to 68° at 2ʰ P. M. The wind which had been ſoutherly ſince the 10th, ſhifted to the north, and the mercury fell to 56° in the evening.

Feb. 6th. *Equal altitudes of the Sun.*
A. M. 9ʰ 18′ 44″. P. M. 2ʰ 23′ 44″.

7th. and 8th. Heavy rain, accompanied with ſharp lightning, and heavy thunder.

9th. Clear—the thermometer 36° at ſun riſe, roſe in the afternoon to 57°.

10th. Clear—the thermometer 30° at ſun riſe, roſe in the afternoon to 60°.

Emerſion of the 2d ſatellite of ♃ obſerved at 9ʰ 10′ 26″. —Very clear, belts diſtinct, magnifying power of the teleſcope 120.

11th. Clear—the thermometer 31° at ſun riſe, roſe in the afternoon to 65°.

12th. Clear—hoar froſt—thermometer 38° at ſun riſe, roſe in the afternoon to 71°.

17th. Clear—the thermometer 59° at ſun riſe, roſe in the afternoon to 74°.

Equal altitudes of the Sun.
A. M. 9ʰ 33′ 16″. P. M. 1ʰ 57′ 33″.

Latitude

Latitude of the City of New-Orleans deduced from the Zenith Distances.

Face of the Sector East.

1799.	β Andromedæ.	β Tauri.	Castor.	Pollux.	α Coro. Borealis.
	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″
Jan. 19th.	4 36 28 N.	1 31 6 S.	2 22 15 N.	1 26 35.5 S.	.....
20th.	.....	.....	.....	.....	2 32 52 S.
21st.	.....	1 31 10 S.	2 22 14 N.	1 26 31.5 S.	.....
22d.	4 36 29 N.	1 31 9 S.	2 22 12.5 N.	1 26 35.5 S.	.....
23d.	4 36 30 N.	.....	.....	.....	2 32 51 S.
Means	4 36 29 N.	1 31 8.3 S.	2 22 13.8 N.	1 26 34.2 S.	2 32 51.5 S.

Face of the Sector West.

	.....	.....	.....	1 28 16 S.	.....
24th.	4 34 49 N.	1 32 47 S.	2 20 35 N.	1 28 17 S.	2 34 34 S.
25th.	4 34 46 N.	1 32 50 S.	.....	.....	.....
26th.	.....	.....	.....	.....	2 34 31.5 S.
Means	4 34 47.5 N.	1 32 48.5 S.	2 20 35 N.	1 28 16.5 S.	2 34 32.7 S.
Means face west	4 36 29 N.	1 31 8.3 S.	2 22 13.8 N.	1 26 34.2 S.	2 32 51.5 S.
Means	4 35 38.2 N.	1 31 58.4 S.	2 21 24.4 N.	1 27 25.3 S.	2 33 42.1 S.
Refractions	+ 4.5	+ 1.5	+ 2.3	+ 1.5	+ 2.5
Correct zenith distances	4 35 42.7 N.	1 31 59.9 S.	2 21 26.7 N.	1 27 26.8 S	2 33 44.6 S.
Mean declinations, 23d Jan. 1799.	34 33 6.8 N.	28 25 23 N.	32 18 49 N.	28 29 53.2 N.	27 23 59.5 N.
Aberrations	+ 7.0	+ 2.5	— 1.6	—2.4	— 11.3
Nutations	— 3.8	+ 4.6	+ 7.6	+7.5	— 1.2
True declinations	34 33 10 N.	28 25 30.1 N.	32 18 55 N.	28 29 58.3 N.	27 23 47 N.
Correct zenith distances applied	—4 35 42.7 N.	+1 31 59.9 S.	−2 21 26.7 N.	+1 27 26.8 S.	+2 33 44.6 S.
Latitudes	29 57 27.3 N.	29 57 30.0 N.	29 57 29.3 N.	29 57 25.1 N.	29 57 31.6 N.

Latitude

		°	′	″
Latitude by	β Andromedæ .	29	57	27.3
do. .	β Tauri . .	29	57	30.0
do. .	Caſtor . .	29	57	29.3
do. .	Pollux . .	29	57	25.1
do. .	α Coro. Borealis .	29	57	31.6
Mean Latitude north . .		29	57	28.7

The above determination differs but 16″.3 from the latitude of New-Orleans as ſtated in the requiſite tables, and which may have ariſen from the obſervations being made in different parts of the city.

Longitude of the city of New-Orleans, deduced from the eclipſes of ♃'s ſatellites.

1799.		′	″	Daily loſs. ′	″
Jan. 14th.	Clock too ſlow mean time .	9	56		
15th.	. . . do. . . .	10	33	. . 0	37
19th.	. . . do. . . .	12	59	. . 0	36.5
20th.	. . . do. . . .	13	37	. . 0	38
22d.	. . . do. . . .	14	49	. . 0	36
24th.	. . . do. . . .	16	1	. . 0	36
Feb. 6th.	. . . do. . . .	24	27	. . 0	38
17th.	. . . do. . . .	29	6	. . 0	25.4

From the 24th of January, till I left New-Orleans, I was engaged in decking, and rigging a ſchooner, to tranſport our baggage, apparatus, and proviſions along the coaſt, and therefore unable to attend conſtantly to the going of the clock, which was ſet up in a place much expoſed, and probably the caſe was by ſome accident ſhifted a ſmall matter between the 6th, and 17th of February, from the poſition it had when ſet up: This appears likely from the rate of the clock's going during that interval.

An emerſion of the 1ſt ſatellite of ♃ was obſerved on the 14th of January at 6^h 10′ 37″ P. M.—the clock was then too ſlow mean time 10′ 05″, the obſervation was therefore made at 6^h 20′ 42″ mean time, from which deduct 9′ 48″ the equation of time, and the remainder 6^h 10′ 54″ will be the apparent time, which deducted from 12^h 12′ 19″ the apparent time at Greenwich by the theory, the remainder 6^h 1′ 25″ will be the difference of meridians.

An emerſion of the 1ſt ſatellite of ♃ was obſerved on the 21ſt of January at 8^h 2′ 9″ P. M. The clock at the time of obſervation was 14′ 34″ too ſlow mean time, the obſervation was of courſe made at 8^h 16′ 43″ mean time, from which deduct 12′ 0″ the equation of time, and the remainder 8^h 4′ 43″ will be the apparent time of the obſervation, which deducted from 14^h 5′ 43″, the apparent time at Greenwich by the theory, the remainder 6^h 1′ 00″ will be the difference of meridians.

On

On the 10th of February at 9^h 10′ 26″ P. M. an emerſion of the 2d ſatellite of ♃ was obſerved, the clock was then 26′ 26″ too ſlow mean time, the obſervation was therefore made at 9^h 36′ 52″ mean time, from which deduct 14′ 38″ the equation of time, and the remainder 9^h 22′ 14″ will be the apparent time of the obſervation, which taken from 15^h 22′ 5″ the apparent time at Greenwich by the theory, the remainder 5^h 59′ 51″ will be the difference between the meridians.

The longitude given by the 2d ſatellite, does not appear from the theory to be entitled to more than half the weight of either of thoſe by the firſt; this being admitted, the longitude will be had as below.

	Longitude weſt.
By the emerſion of the 1ſt ſatellite on the 14th of Jan.	6^h 1′ 25″
	6 1 25
By . do. . on the 21ſt of Jan.	6 1 0
	6 1 0
By an emerſion of the 2d ſatellite on the 10th of Feb.	5 59 51
Mean	6 0 56 = 90° 14′ weſt

from Greenwich, or 1^h 0′ 21″ = 15° 5′ 15″ weſt from Philadelphia.

The longitude of the city of New-Orleans is ſet down in Robertſon's Navigation at 89° 54′ 0″ or 5^h 59′ 36″ weſt. In the requiſite tables at 89° 58′ 45″ or 5^h 59′ 55″ W. and by the French academicians* at about 90° or 6^h weſt from Greenwich.—The difference is not conſiderable, and perhaps the reſult of my obſervations may agree with the foregoing authorities ſtill more nearly, when compared with correſponding ones, or others made about the ſame time, at any obſervatory the longitude of which has been accurately ſettled.

The obſervations on the paſſage of the ☽ over ♃, and three of his ſatellites, before mentioned, will be reduced to apparent time, by adding 34″ to each obſervation.

Obſervations made on the tranſit of ☿ in May 1799 at Miller's place on the Coenecuch river, commonly, (though erroneouſly), called the Eſcambia, in lat. 30° 49′ 33″ N. by meaſurement, from the ſouth boundary of the United States, and due ſouth from the end of two hundred and forty-eight miles, and one hundred and eighty-ſix perches eaſt from the Miſſiſſippi, in the parallel of 31° N. lat.

May 2d. The inſtruments arrived in a boat from the head of Penſacola-Bay.

* Expoſition du calcul par de la Lande 1762.

3d. Put up the clock and ſet it to apparent time nearly.

Equal altitudes of the Sun.
$3^d\ 20^h\ 22'\ 34''$. $4^d\ 3^h\ 37'\ 27''$.

4th.

Equal altitudes of the Sun.
$4^d\ 20^h\ 30'\ 17''$. $5^d\ 3^h\ 29'\ 51''$.

5th.

Equal altitudes of the Sun.
$5^d\ 20^h\ 22'\ 47''$. $6^d\ 3^h\ 37'\ 45''$.

6th. At 19^h ☿ appeared beautifully defined through a middling heavy fog on the face of the ſun, at 21^h the fog diſappeared.

	h	′	″
The internal contact at the egreſs was obſerved by myſelf at . .	22	45	24
The external do. at	22	48	29.5

The external contact is certain within the $\frac{1}{2}$ of a ſecond. —Magnifying power of the teleſcope 200.

	h	′	″
The internal contact at the egreſs was obſerved by Capt. Stephen Minor, His Catholic Majeſty's commiſſioner, at . .	22	46	21
The external do. at	22	48	14

Magnifying power of the teleſcope 35.

The internal contact at the egreſs was obſerved by my aſſiſtant Mr. David Gilliſpie at . .	22	46	21
The external do. at	22	47	59

Magnifying power of the teleſcope 25.

Equal altitudes of the Sun.
$6^d\ 20^h\ 15'\ 21''$. $7^d\ 3^h\ 45'\ 36''$.

The

The rate of the clock's* going deduced from the equal altitudes.

				Daily gain.
		′ ″		′ ″
May 4th.	Clock too faſt mean time .	3 23	. .	0 11
5th.	. . do.	3 34	. .	0 17
6th.	. . do.	3 51	. .	0 15
7th.	. . do. . . .	4 6		

The clock was 4′ 5″ too faſt mean time when the obſervations on the tranſit of ☿ were made, and the equation of time 3′ 44″ additive to the mean time, the difference therefore between 4′ 5″ and 3′ 44″ being deducted from the obſervations will give the apparent times.

A Lunar obſervation made near the mouth of the Chattahocha.

It was my original intention to have taken charts of the ſouthern parts of all the rivers interſected by the 31ſt degree of N. lat. and falling into the gulf of Mexico between the Miſſiſſippi, and St. Marks: But having no buſineſs up or down the Paſkagola, (which is a large river and navigable for boats of burden many miles above the boundary), it was omitted.—The Chattahocha, or as it is ſometimes called the Appalachicola, is a river of more importance than the former, and a map of it from the boundary to its mouth was a deſirable object; but owing to the precipitate manner we had to leave the country in conſequence of the hoſtile diſpoſition of the Indians, and deſcending the river partly in the night, it was impoſſible to take a ſketch of it with any tolerable degree of accuracy.—About 4 minutes of a degree north of the entrance of its weſtern branch into St. George's Sound, I found the latitude to be about 29° 46′ 51″ N.—At the ſame place

* The clock was well faſtened to a poſt ſet 3½ feet in the ground, but being neither covered, nor ſurrounded by any building, and ſeveral hundreds of Indians in our camp, ſome individuals of whom were frequently leaning againſt the poſt, (though admoniſhed to the contrary), which circumſtance might produce a ſmall irregularity in the going of the regulator.

on the bank of the weſtern branch, the following obſervations were made to determine the longitude.

1799.	Watch N° 1.	Watch N° 2.	Double alt. ☉'s upper limb.	
	d h ′ ″	d h ′ ″	° ′ ″	
Sept.	22 20 23 17	22 20 23 38	61 3 0	
	22 20 23 46	22 20 24 8	61 47 10	
	22 20 24 11	22 20 24 33	61 57 30	Error of Sextant add 10″.
	22 20 24 49	22 20 25 11	62 12 40	
	22 20 25 19	22 20 25 41	62 24 40	
	22 20 26 19	22 20 26 42	62 49 50	
Means	22 20 24 37	22 20 24 59	62 2 28	

The obſerved times, and diſtances of the ☉'s and ☽'s neareſt limbs.

			Diſt. of the limbs.	
	d h ′ ″	d h ′ ″	° ′ ″	
	22 21 0 8	22 21 0 34	74 45 0	
	22 21 0 43	22 21 1 9	74 44 30	
	22 21 1 24	22 21 1 49	74 44 30	
	22 21 1 57	22 21 2 23	74 44 20	Error of Sextant add 10″.
	22 21 3 20	22 21 3 49	74 44 0	
	22 21 4 13	22 21 4 40	74 43 50	
	22 21 4 38	22 21 5 6	74 43 40	
Means	22 21 2 20	22 21 2 47	74 44 16	

	Watch N° 1.	Watch N° 2.	Double alt. ☉'s upper limb.	
	d h ′ ″	d h ′ ″	° ′ ″	
	22 21 7 58	22 21 8 26	79 14 0	
	22 21 8 35	22 21 9 3	79 27 30	Error of Sextant add 10″.
	22 21 9 8	22 21 9 37	79 40 30	
	22 21 10 1	22 21 10 30	80 1 0	
Means	22 21 8 55	22 21 9 24	79 35 45	

The firſt and third ſets of obſervations were made to determine the error of the watches and their rate of going. By the firſt ſet of obſervations watch N°. 1 appeared to be too ſlow 13″ and N°. 2 too faſt 9″. By the third ſet made about 44½ minutes after the firſt, the watch N°. 1 was too ſlow 23″ and N°. 2 too faſt 6″—hence N°. 1 loſt 10″ in 44½ minutes and N°. 2 loſt 3″ nearly in ſame time. The errors of the watches reduced to the time of the lunar obſervation and applied to it will give 22^{d} 21^{h} 2′ 41″ for

for the correct apparent time. The longitude of the place of observation was estimated at 5^h 39′ west from Greenwich. From the latitude of the place, the apparent time of the observation, and the estimated longitude, the true altitude of the ☽'s centre comes out 64° 53′ 52″ and that of the ☉'s 38° 14′ 50″—from which the longitude will be had as follows:

	°	′	″		
☽'s true altitude	64	53	52		
☉'s do.	38	14	50		
Difference true altitudes	26	39	2		
☽'s apparent altitude	64	29	58		
☉'s do.	38	15	56		
Difference apparent altitudes	26	14	2		
Apparent dist. ☽'s and ☉'s centres	75	16	4		
Sum	101	30	6		
Difference	49	2	2		
½ Sum	50	45	3	S	9.8889664
½ Difference	24	31	1	S	9.6180087
☽'s apparent altitude	64	29	58	co. or c. S	0.3660068
☽'s true altitude	64	53	52	S	9.6276060
☉'s apparent altitude	38	15	56	co. or c. S	0.1050480
☉'s true altitude	38	14	50	S	9.8950616
				2)	39.5006975
Difference true altitudes	26	39	2		19.7503487
½ Difference true altitudes	13	19	31	S	9.3626515
	67	43	46	T[t]	10.3877172
	67	43	46	c. S	9.5786170
	37	27	22.5	S	9.7840145
			2		
True distance	74	54	45.0		
Dist. at Greenwich at noon the 23^d 0^h	76	14	17		
Do. 23^d 3^h	74	45	57		
Difference between the 1st and 2d	1	19	32	P. L.	3547
Do. between the 2d and 3d	1	28	20	P. L.	3091

0456 = 2^h 42′ 4″ which

which added to 23 days will give for the time at Greenwich	$23^{d}\ 2^{h}\ 42'\ 4''$
from which deduct the apparent time of the obſervation	22 21 2 41
Longitude of the place of obſervation weſt . .	0 5 39 23

The above determination of the geographical poſition of the place of obſervation, is probably as correct, if not more ſo, than in our beſt charts. From this example it may be ſeen with what eaſe, both the latitudes, and longitudes of places may be determined on land for common geographical purpoſes with a good ſextant, a well made watch with ſeconds, and the artificial horizon, the whole of which may be packed up in a box of 12 inches in length, 8 in width, and 4 in depth.

This paper being now carried to the length intended, and embracing the objects propoſed, I have only to add that

I am with ſincere eſteem,

Your friend, &c.

AND$^{W.}$ ELLICOTT.

Mr. ROBERT PATTERSON,
V. P. American Philoſophical Society.

No.